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DEVELOPMENT (D3)

Systems and Infrastructures to Implement Sustainable Space Development and Settlement - Systems (2A)

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GROUND-BASED CAPABILITIES FOR LUNAR INFRASTRUCTURE TESTING

Abstract

A focus of NASA's Moon-to-Mars objectives is the development of the infrastructure on the lunar surface that will be needed to support broader lunar surface operations. This infrastructure is intended to support both United States and international partners to expand human presence on the lunar surface. As this lunar infrastructure is designed and established, it will be critical to ensure that the various hardware elements work together to both enable the capabilities and to avoid unintended actions.

NASA's Glenn Research Center (GRC) is establishing ground-based testing and emulation facilities to mimic the lunar environment that the surface power and communications infrastructure will operate in. These facilities are intended to represent power and communications providers, users, and interfaces to ensure that systems operate as intended to support the lunar economy. They will empower industry to rapidly evaluate new technologies under realistic conditions.

In 2023 GRC is opening a new, state-of-the-art, Aerospace Communications Facility featuring hardware-in-the-loop and ground-to-orbit testbeds. The Multiple Asset Testbed for Research in Innovative Communications Systems (MATRICS) capability will emulate the lunar communications environment, enabling validation of mission concepts and technologies to reduce risk through performance and operations testing, training, and uncover potential issues in compatibility among communication systems providers and users.

In addition to the communications testbed, GRC is also developing a full-scale power grid to reduce lunar mission risk. The Adaptable Surface Power Integration Research (ASPIRE) project aims to reduce mission and hardware risk via high-fidelity integrated testing and pave the way for commercially supplied utility power on the lunar surface. The facility will be scalable and highly adaptable and will be available to NASA, Industry, Academia, and International Partners. ASPIRE will allow developers to demonstrate their power solutions in a relevant environment, and it will be able to characterize the lunar power performance in representative mission contexts.